REMARKS

The Examiner rejected claims 57 through 66, 73 through 77, 91 through 93, and 112 through 114 as being anticipated under § 102(e) or as being obvious under § 103 over Tsutsui et al. (U.S. Pat. 5,132,998). Furthermore, the Examiner rejected claims 67, 82 through 85, 88/83, 89/83 and 116 as being obvious under § 103 over Tsutsui in view of Donges et al. (U.S. Pat. 4,788,704). The Examiner also rejected claim 68 as being obvious under § 103 over Tsutsui in view of Alvarez et al., and claim 69 further in view of Donges, and claims 86, 87, 88/86, and 89/86 over Tsutsui and Donges further in view of Alvarez. Applicants respectfully disagree with these rejections.

Applicants have amended claims 57, 82-84, 87-91, 93, 94, 102-105, 108, 110, 112, 114, and 116-118 to further distinguish and clarify the invention over the above-cited art and to overcome the rejections under 35 U.S.C. § 112 and objections under 37 C.F.R. 1.75(c).

As claimed in claims 91 and 112, the invention is a device and a method for detecting specific material of interest in an initially unidentified ensemble of objects. The device includes a conveyor, a stationary X-ray exposure system, and a stationary X-ray detection system positioned to detect X-ray radiation transmitted through the ensemble of objects and provide data corresponding to the intensity of transmitted radiation of at least two energies. The device also includes a computer programmed to calculate a value of a specific property of the specific material of interest in the ensemble of objects, and automatically discriminate the specific material of interest from other objects that are present based on the calculated value of the specific property. This automatic discrimination utilizes X-ray transmission data of rays passing through the initially unidentified ensemble of objects, and near but not through the specific material of interest to remove the contribution of unwanted overlying and underlying material of the ensemble of objects from the calculated value of the specific property of the specific material of interest. The computer is also programmed

to automatically indicate, based on the discrimination, presence of the specific material of interest while the ensemble of objects progresses on the conveyor.

This invention patentably differs from Tsutsui since Tsutsui does not disclose how to remove the contribution of initially unidentified overlying and underlying material from the calculated value of the specific property. Tsutsui teaches an image processing method or apparatus that can identify elements or materials. In col. 3 line 64 through col. 4 line 11, Tsutsui specifically teaches the following:

> FIG. 4 shows the outline of the above-mentioned image processing. Two transmission images are prepared by using two kinds of energies. These transmission images are transformed into logarithmic images (a), (b) by applying a logarithmic transformation on the transmission images. One image (b) of the logarithmic images (a), (b) is multiplied by a coefficient X, and a subtraction is conducted between these logarithmic images. The image (c) obtained through the subtraction is investigated while changing the coefficient X. For example, in FIG. 4, the coefficient value is read out just when the triangular figure of the subject eliminates from the image. This coefficient corresponds to the contrast ratio of the triangular figure, and can identify the quality of the material of the triangular figure.

As stated by the Examiner, Tsutsui can vary the coefficient X until an imaged subject is subtracted out of the logarithmic image. Such value of the coefficient is equal to the contrast ratio (i.e., a specific property) of what was exposed to the X-rays. Based on this contrast ratio, Tsutsui can identify the subject if he can match it to a known contrast ratio, such as the ratios corresponding to atomic numbers of materials, as shown in Figs 2 and 3. However, Applicants respectfully disagree with the Examiner's statement that Tsutsui can "eliminate background information, and automatically indicate the presence of the specific material."

Tsutsui does not teach, or even hint, the removal of the contribution of an initially unidentified overlying and underlying material. Where there is an overlying (or underlying)

material over the specific material of interest, the value of Tsutsui's coefficient is equal to the contrast ratio that is influenced by both the overlying (or underlying) material and the specific material of interest. In this situation, Tsutsui does not disclose, or even hint, how to modify such coefficient to identify the specific material of interest. Therefore, Tsutsui does not disclose the invention claimed in the independent claims 91 and 112. The independent claim 57 includes the above-discussed limitations of claim 91 and is thus allowable for the same reasons.

As claimed in independent claims 82 and 116, the invention is also a device and a method for detecting a specific material of interest in an ensemble of objects. The device includes a conveyor, an X-ray source for exposing sequentially the ensemble of objects to a flux of X-ray radiation, and stationary X-ray detectors positioned to detect transmitted X-ray radiation. The detectors provide data corresponding to the intensity of transmitted radiation and also provide repeatedly a detector output representing "no X-ray flux" data taken after the X-ray exposure when no X-ray radiation is arriving at the detectors. The "no X-ray flux" data also include a decay signal induced by the X-ray flux. A computer receives from each detector both the X-ray data and the "no X-ray flux" data and corrects, for each detector, the X-ray data by eliminating contribution of the "no X-ray flux" data to the X-ray data. The computer then determines from the corrected X-ray data the presence of the specific material of interest in the ensemble of objects.

This invention patentably differs from Tsutsui alone or in combination with Donges because it performs a completely different type of data correction. Donges measures initially his offset values with the X-ray source turned off. (Donges also measures reference signal, R_i, for each detector at 100% X-ray radiation, but this is for normalization, which is not related to this discussion.) As shown in his figure and described in the corresponding description, the an offset value for each detector

channel is stored in an offset RAM 13. Then, during the X-ray inspection, the stored offset value is subtracted from the total signal S_i by a subtraction unit 7. Donges does not measure his offset values repeatedly after the X-ray exposure of the luggage or package.

On the other hand, the device and method of the claimed invention takes repeatedly "no X-ray flux" data after the X-ray exposure of the ensemble of objects when no X-ray radiation is arriving at the detectors. Importantly, this type of "no X-ray flux" data also includes a decay signal induced by the X-ray flux, and the decay signal varies with the intensity of the detected X-ray flux. Among other differences, the initially measured offset values of Donges cannot reflect these variations. Then, as claimed, the computer corrects the X-ray data by eliminating the contribution of the "no X-ray flux" data. Neither Tsutsui nor Donges even hint about this type of novel data correction. This qualitatively different data correction is not an obvious modification of the teaching of Donges. Therefore, the invention claimed in independent claims 82 and 116 is not obvious over Tsutsui in view of Donges.

These differences are more than enough to patentably distinguish independent claims 57, 82, 91, 112, and 116 from Tsutsui alone or in combination with Donges or Alvarez. The rejected dependent claims properly depend from claims 57, 82, 91, 112, and 116 and are thus allowable therewith. (Furthermore, these dependent claims recite novel combinations of features that no prior art reference suggests to combine. For example, there is no suggestion that the scanner of Donges should be combined with the dual energy image processing method of Tsutsui. None of these references suggests that any improvements would be needed.)

The Examiner rejected all claims (including independent claims 94, 102 and 117 not rejected over prior art) under the double-patenting doctrine. To obviate the double-patenting rejections, Applicants are enclosing a Terminal Disclaimer waiving and disclaiming the terminal portion of the term of the

patent to be granted upon this application subsequent to the expiration date of U.S. Patents 5,319,547 and 5,490,218.

Applicants submit that all claims are now in condition for allowance, and such action is respectfully requested.

Filed herewith is a Supplemental Information Disclosure Statement that also replaces the Information Disclosure Statement filed November 18, 1996, with the late submission fee of $230.00 under §1.17(p) (copy enclosed). Also filed herewith is a Petition for Automatic Extension with the required fee of $55.00. Please charge any additional fees, or make any credits, to Deposit Account No. 06-1050.

Respectfully submitted,

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